THE FIELD/FRAME AUTO ASSEMBLY EDIT SYSTEM

With advances in computer programming, video post-production marches on to a new algorithm.

By Sandra Devlin

A video editing system that works 87 percent faster than existing systems, providing comparable cost savings among its other advantages, is certainly newsworthy. The fact that the breakthrough comes by way of a brilliant new computer program—"software of another color"—is especially gratifying. It suggests freedom from certain limitations imposed by general-purpose equipment manufacturers and the potential for creative modifications and developments by individual programmers and designers.

The auto assembly edit system under discussion here is called Field/Frame, and was written and developed by Roman C. Culka, vice president and director of engineering at Devlin Productions Inc. Before comparing and examining Field/Frame apropos of other systems in use today, perhaps a quick historical review is in order, so that you may understand and appreciate the ramifications of Field/Frame—how it works and what it bodes for the future.

Editing Overview

The Television Industry can be divided into two major categories: 1) Production and 2) Post-Production. Production represents the older segment of the industry, one which has existed from the beginning. Many advances have been made here, especially in the area of the video camera, e.g., greater sensitivity, compactness of design, higher resolution and in general, a more suitable product for the job at hand.

Post-production was a natural follow-up created to manipulate the signal in a number of ways. It came about some 30 years ago with the advent of the videotape recorder. Soon after that, attempts were made to edit, sort and transform the TV signal from one form to another. The most significant advance came with the invention of time code. This enabled those working with the tape to electronically identify and divide the information on that tape in such a way as to become manageable. It provided a common reference. In view of videotape not having sprocket holes to serve as a reference, as is the case with film, time code could be considered the most significant discovery in post-production.

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Progress in editing went from manual splicing ("blade-runners," as in film and audio tape editing) to advances in control of the hardware. With the advent of time code editing, the challenge shifted to the control of two or more tape transport mechanisms.

To transfer information from one storage medium to another, so that within that process a different set of values is affected, there must exist both a source and a target. Between the source and the target, a black box is needed that will either allow a pass-thru involving no change or permit an alteration according to a desired formula. This task is further complicated by the need to sync the source and the target in a specific way. The time code serves as a catalyst to the synchronization of these precisely selected in/out points.

At first, attempts were made to sync two-inch quadruplex machines. The transport mechanisms were relatively slow, requiring long pre-rolls (10-15 seconds). Pre-roll is the information existing before the edit point in concert with the synchronization path of the VTRs. Because of respective advancement in the transport/video and computer technology, this pre-roll or synchronization time has become progressively shortened. One can make an analogy with the computer industry in its use of half-inch tape in sorting information from one tape drive to another. And just as those transport mechanisms have become faster and more reliable, so has it come to pass in video.

From the beginning, it has been apparent that the digital control elements were to play a greater and greater role in the control area of the video recorders. At first, in rudimentary functions such as Stop, Play, Fast Forward and Rewind, simple, primitive elements like transistors were used. Later on, as these elements were combined into integrated circuits by the semiconductor industry, they found their way into the control sections of the tape recorders.

As the control sections of tape recorders have become more dominant and concentrated in a single area of the machine, there has been a greater penetration of digital elements in VTR design. Another interesting observation is that even though the digital microprocessors had made their way into the field of electronics as far back as the early '70s, they were not introduced in any serious way in the video industry until the early '80s. It is just now, by the mid '80s, that microprocessor technology has penetrated the video industry at large, and more specifically, the control sections of the videotape recorder.

The microprocessor has taken on the task of controlling the transport mechanism of all the different VTRs that we have today. Many different formats have been developed to handle different tasks on a consumer, industrial or broadcast level. Presently, the broadcast level is tended by the one-inch transport mechanism, the so-called "C" standard format.

Enter the VPR-3

The challenge has been to design a vehicle that can handle the one-inch tape transport in the most efficient manner. The major concern is the ability to carry the tape from one point to another as quickly and safely as possible with minimum damage to the medium (tape) and with the added responsibility of displaying the picture information during the act of transportation. The best approximation of all of these requirements has been approached at the highest technical level by the VPR-3, designed and manufactured by Ampex.

It is much more difficult to record TV information than computer information. The bandwidth—the number of pixels or number of bits that must be recorded per unit of time—is two to three times greater than the best computer drive is capable of these days. The requirement to see the information during the transport process further complicates it. The VPR-3, at the moment, represents the best implementation of all of these different and sometimes contradictory requirements.

The VPR-3 has accomplished this by borrowing some of its technology from the computer industry. The most important example is the use of pressurized air as a lubricant. This proven technology minimizes the friction between the medium

being transported (tape) and the physical entity guiding the medium (VPR-3 tape guides). Another design breakthrough which governs the speed of the tape across the transport mechanism is the use of a vacuum capstan instead of the conventional combination of a rubber pinch roller and capstan shaft.

The third advance is the introduction of the microprocessor into the servo loop of the transport mechanism itself. The microprocessor is used to govern, control, diagnose and monitor the electronic circuitry that performs the task of carrying the tape. This advanced circuitry watches over and guides the mechanism and reports the internal events of the machine to the user. Appointing some of these heretofore human monitoring tasks to the microprocessor in the VTR represents a more modern man/machine interface.

As a result, we now have a tape recorder that allows video information to be handled in a manner that approaches the processing of pure digital information. This opens new vistas to the way we have approached the processing of video information in the past.

Apropos of the editing process, the smallest unit in TV is one field (two fields = one frame), hence 30 frames/sec. For many years it has been possible to edit on a frame-by-frame basis, but doing so has often been clumsy, unpredictable and cause for apprehension. For the first time, a machine exists which allows the control of information, by field or frame, on a transport mechanism without any fear for the safety of the medium. Now the editor is freer to concentrate on the design transformation alone.

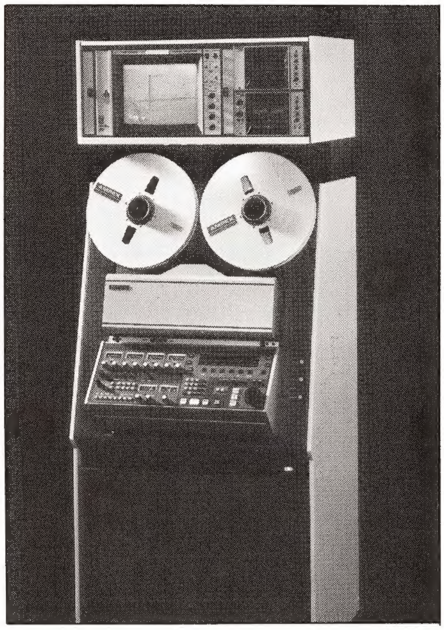
With the VPR-3, one can make the abstraction that the medium (the tape) is in a black box (the VPR-3) and that the black box (VPR-3 and tape) is controlled by a computer. Videotape can now be manipulated with the same flexibility and freedom with which a computer handles its regular information tasks. One can forget that this is a TV signal. In fact, the VPR-3 can be considered as simply another computer peripheral.

One may now proceed to develop applications as diverse as the user's own imagination and programming skill will permit. An immediate and obvious application is laserdisc, with its intrinsic identification with single-frame information for which it is infinitely suited.

Next month we will continue this perspective on auto assembly editing and discuss the software ramifications of Field/Frame, which has fused the VTR and computer entities into a high-performance yet easily modifiable and expandable system. Included will be a prototype diagram plus highlights of a videodisc session edited by the Field/Frame system. □

**Field/Frame is a trademark of Devlin Productions, Inc.*

The VPR-3 (right): the newest computer peripheral. Below: print-out from an edit decision list (top); diagram (middle) and close-up (bottom) of the VPR-3 transport system.



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     3 0001 CC 00:03:10:08 00:03:10:09 01:00:00:05 01:00:00:06 CHAP 1
     4 0001 CM 00:03:10:09 00:03:10:13 01:00:00:06 01:00:00:10 CHAP 1 OFF
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